



Introduction to the course
and
TOPIC 1 BSE/vCJD





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Introduction to the course and TOPIC 1 BSE/vCJD



This book contains the Introduction to the course for S250 *Science in Context* and also Topic 1 BSE/vCJD. The Introduction to the course provides brief synopses of the seven scientific topics that form the core of S250. It also introduces the four themes – communication, risk, ethical issues and decision making – that permeate these topics. Topic 1 BSE/vCJD documents the key scientific and societal developments that surrounded the emergence of the cattle disease BSE (bovine spongiform encephalopathy) and detection of the fatal human brain disease, vCJD (variant Creutzfeldt–Jakob disease). Arguably, the management of these two linked diseases has influenced many people's perceptions of new developments in science and of reassurances concerning safety offered by politicians and experts.

ISBN 978-0-7492-2681-7



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TOPIC 2

Near-Earth objects and the impact hazard





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Near-Earth objects and the impact hazard



Topic 2 Near-Earth objects and the impact hazard, which is part of the course S250 *Science in Context*, describes the low-probability but high-consequence hazard posed to Earth by asteroids and comets. The book introduces the astronomy of Solar System bodies and describes the evidence for past impacts on Earth, both small impacts such as the Barringer Crater that formed 50 000 years ago (cover image) and extremely rare events such as the end-Cretaceous impact at Chicxulub. The book also examines the consequences of a major impact on present-day Earth and the progress towards detecting the potentially threatening bodies that orbit close to the Earth.



TOPIC 3

Water and well-being: arsenic in Bangladesh





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Water and well-being: arsenic in Bangladesh



Tens of millions of people in low-lying Bangladesh face a stealthy hazard from the primary requirement for life: drinking water. Geoscientists discovered arsenic contamination in well waters in the 1990s. Many Bangladeshis already show signs of chronic poisoning. The causes are entirely natural chemical phenomena in the source of groundwater. High arsenic concentrations could have been detected long before they were had it been known more widely that people in neighbouring West Bengal were suffering from arsenicosis. This book describes the science behind arsenic's toxicity and how it came to affect so many people, and may be causing ill health elsewhere. It also examines issues of ethics and poor scientific communication surrounding the tragedy, together with means of removing the threat.

ISBN 978-0-7492-2680-0



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TOPIC4 Medicinal plants





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TOPIC 4

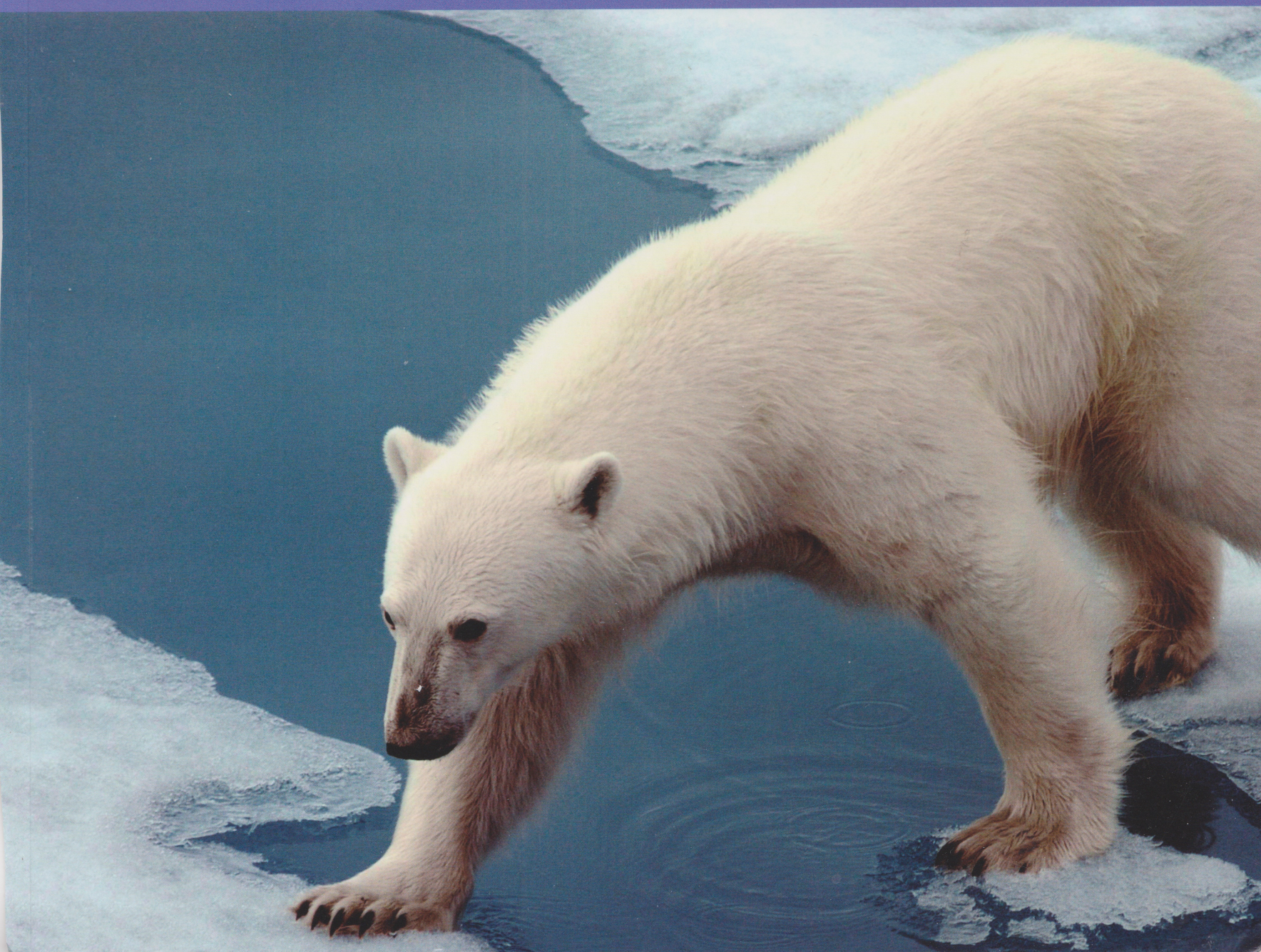
Medicinal plants



The front cover shows the leaves of a medicinal plant. The translucent dots on the leaves indicated to our ancestors that this was a plant that worked on deep wounds. The structure of the flowers and the colour of the sap suggested other cures. Today, scientists test the effects of the same plant with detailed experiments and advanced equipment. Curiously, the ancient predictions and the modern science are in some agreement. This topic explains the science and the legend behind medicinal plants. It shows how very different methods over many centuries have helped to produce the pharmaceutical products upon which so many of us rely.



TOPIC 5 Climate change





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TOPIC 5

Climate change



The focus of Topic 5 Climate change is one of the most high-profile, and challenging, environmental issues of our times: the warming of the Earth brought about by an atmosphere enriched in carbon dioxide (and other greenhouse gases) due to human activities, especially our use of fossil fuels. The book examines the scientific principles and evidence underlying this issue, including the role of computer modelling studies in assessing the potential consequences for our planet of allowing human-induced global warming, and the resulting effects on sea levels and climate patterns around the world, to continue unchecked. Emphasis is placed throughout on the wider social, economic and political context of the 'greenhouse warming' issue, and on the way persistent uncertainties in the scientific understanding of climate change feed into the highly complex realities of mapping out an effective, and equitable, approach to tackling this problem at all levels, right through to international treaties such as the Kyoto Protocol.



TOPIC 6

Genetic manipulation





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TOPIC 6

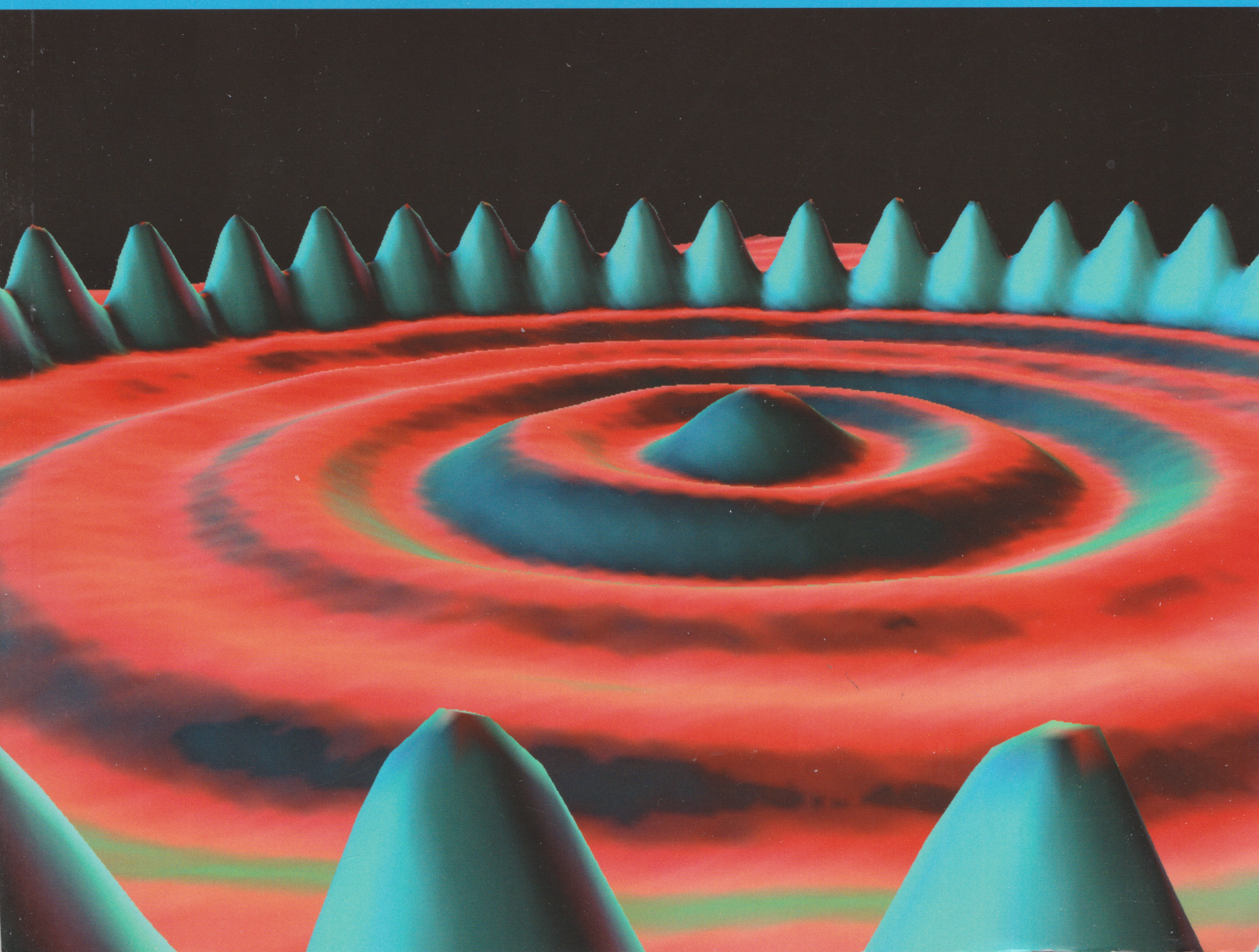
Genetic manipulation



In recent years, scientists have made huge gains in their understanding of how genes can be altered and transferred from one organism to another – but that knowledge has been acquired amidst controversy and concern, as the front cover illustrates. The deep ethical concerns that have resulted from the emergence of genetic manipulation are explored in this topic. We begin with an examination of the basic structure and function of genes. A number of pioneering examples and techniques are explored, helping to explain why our present-day view of genetic manipulation can combine feelings of optimism and unease. Examples are drawn from both plants (notably GM crops) and animals (including Dolly the sheep), with a special emphasis on the implications of promising medical techniques such as gene therapy. Our hope is that by exploring the science 'behind the headlines', and its interactions with the equally complex social factors, we will acquire a clearer idea of both what is possible and what may be desirable.



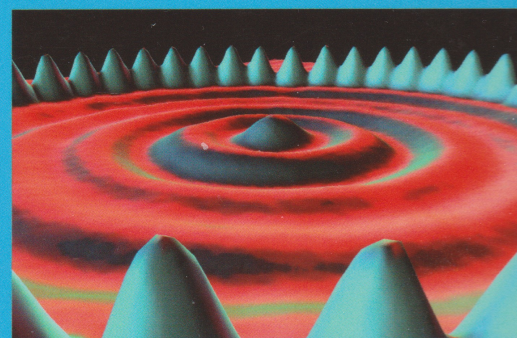
TOPIC 7 Nanotechnology and Conclusion to the course





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TOPIC 7 Nanotechnology and Conclusion to the course



Topic 7 Nanotechnology, the final topic of the course S250 *Science in Context*, provides an introduction to this rapidly developing field, setting nanotechnology in the context of the attention it is receiving from governmental and non-governmental agencies as well as the media. The book considers what it means to work at the nanoscale and describes two types of development in this very interdisciplinary area: the nanoscience of materials and the creation of bio-nanotechnological devices which could be inserted into living systems. The way in which the risks are assessed is discussed, as are the concerns about the ethical issues and uncertainties involved.

The Conclusion to the course then revisits several themes-related questions from the perspective of having studied all seven topics of S250.